The Motorola R-2680: A Basic Description.

The R-2680 Communications System Analyser is a radio test instrument that tests and performs service on the following equipment:

- ***Two-way radios***
- ***MPT 1327/1343 radios***
- ***Pagers***

In addition, the R-2680 is used for manufacturing tests and engineering design.

The R-2680: It's the best test for two-way conventional and MPT trunked radios and pagers.

Motorola Communications Test Equipment is proud to present the R-2680 with optional MPT 1327/1343 trunking test capability. If you need to calibrate, maintain, service or design radio communications equipment – including two-way conventional and MPT trunked radios and pagers – the Motorola R-2680 is for you.

Because of its unique design, the R-2680 allows you to perform many complex functions with one single piece of equipment. This "one box" design is particularly helpful in remote sites where multiple pieces of heavy equipment are either impractical or impossible. The R-2680 is rugged enough to withstand heavy activity. It also has the flexibility of being operated from a variety of power sources, making it ideal for use in the field. The R-2680 is designed to save you time and help you work more efficiently – all of which improve your profit.

Whether used in your shop, at your customer's site or in a remote location, let the Motorola R-2680 – and our experience – work for you.

Features and benefits.

The R-2680 gives you cost savings and space savings because it does the job of each of these individual test instruments:

- Signal Generator
- Measurement Receiver
- RF Scanner
- Spectrum Analyser
- Duplex Generator
- Audio Frequency Counter
- AC / DC Voltmeter
- Digital Oscilloscope
- RF Wattmeter
- Signal Strength Meter
- SINAD Meter
- Distortion Meter
- Tracking Generator
- Signaling Simulator

The R-2600 family of Communications System Analysers is known for its user-friendly efficient operation. The R-2680 is no exception because:

The display is organized into easy-to-read windows for quick comprehension of test results

Test settings and results are displayed simultaneously, eliminating the need to switch between screens

Soft keys permit quick access to the many menu selections, simplifying test setups

Built-in memory easily stores and recalls frequently used configurations

Built-in “help screens” give instant access to user information

The result is a reduction in the cost of servicing and testing equipment, simply because both functions can be accomplished quickly and efficiently with the R-2680.

Feature Summary:

RF Functions:

Selectable from RF Control Zone

- RF Monitor
- RF Generator
- Duplex Generator
- Sweep Generator
- Tracking Generator (Optional)

Modulation and Audio:

Modulation:

Selectable from RF Control Zone

- Frequency Modulation (FM)
- Wide Band and Narrow Band Format
- Amplitude Modulation (AM)
- Phase Modulation (PM) Optional

Audio:

Selectable from Audio Control Zone

Also refer to Meter Modes: Signal Decoding

- Fixed 1 kHz Tone
- Private-Line
- Digital Private-Line
- Tone A
- Tone B
- 5/6 Paging Tones
- Select 5 Tones
- A/B Sequence Tones
- General Sequence Tones
- Tone Remote
- Dual Tone Multi Frequency (DTMF)
- External Modulation Input

Graphic Display Functions:

Selectable from Display Control Zone

This Zone can be expanded to fill the whole screen

- Spectrum Analyser
- Modulation Scope
- Oscilloscope
- Sweep Generator Display
- Bar Graphs
- Tracking Generator Display (Optional)

Measurement Functions:

Selectable from Display Control Zone: Meter section

- RF Display
  - Frequency
  - Modulation Measurement
  - Frequency Error
  - RF Level
- RF Scan (usable as a frequency counter)
- Preset Scan
- AC / DC Voltmeter
- Internal/External Distortion
- SINAD

Distortion and SINAD can also be measured using optional:

- C Message Filter
- CCITT Filter
- Selectable 600 Ohm or 1 Meg Ohm load

- Signal Decoding
  - Private-Line
  - Digital Private-Line
  - Dual Tone Multi Frequency (DTMF)
  - General Sequence
  - 5/6 Paging Tones
  - Select 5 Tones
- Audio Frequency Counter
- Cable Fault (Optional)

Options:

MPT 1327 Analogue Trunking Option

Radio and System Call Tests for the following formats:

- Individual
- Group
- All
- PABX (Private Automated Branch Exchange)
- PSTN (Public Switch Telephone Network)
- Status Message
- Short Data Message

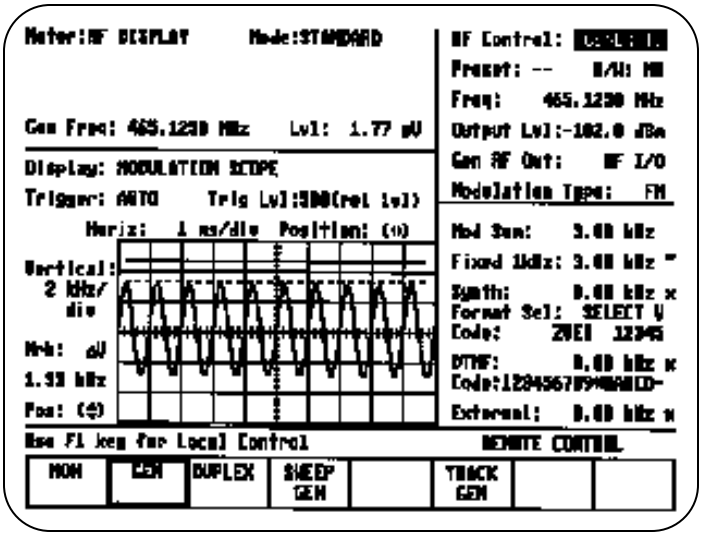
Auto Test measurements (Maximum of 3 Channels):

- SINAD
- FM Deviation
- Frequency error
- RF Power

Other features:

- 10 predefined system parameters
- 10 user system parameters definable
- Recall Telegram screen for up to 99 Telegrams

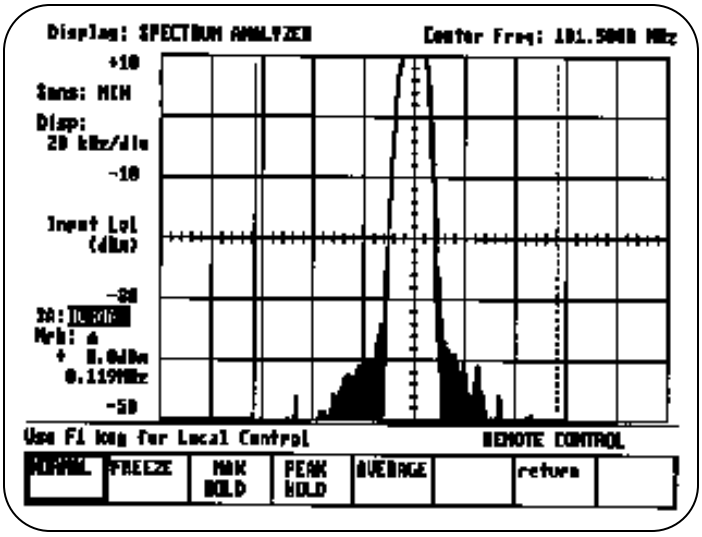
STANDARD FEATURES



Standard features and benefits that make the R-2680 so powerful include:

- RF signal generator with AM, FM and optional Phase Modulation
- Sensitive measurement receiver
- Duplex generator that provides increased service capability
- Sweep generator combined with spectrum analyser for added applicability
- Help screens provide instant assistance
- Logical and complete parameter display
- Convenient Soft key design
- Single keystroke printing of screen graphics and parameters
- Self calibration for reliability and accuracy

GRAPHIC DISPLAYS



The R-2680 is equipped with these graphic displays:

- Spectrum Analyser
- Modulation Oscilloscope
- External Oscilloscope
- Bar Graph
- Tracking Generator
- Sweep Generator

These displays can be viewed by imbedding them as one of the four windows / zones or by expanding them to full screen for more detailed viewing.

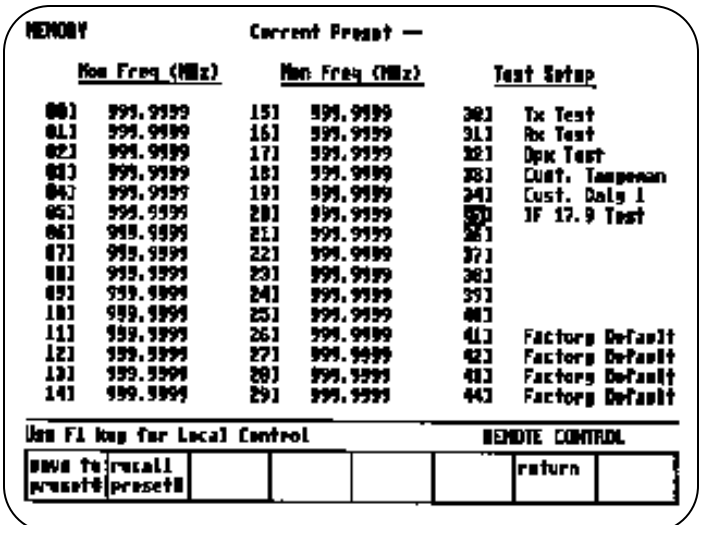
With the High Performance Option, efficiency is enhanced with:

- Markers for easy measurement of amplitude, frequency and duration
- Increased frequency dispersion on the:
  - Spectrum Analyser
  - Tracking Generator (optional)

The combined Tracking Generator and High Performance Options:

- Eliminate the need for additional expensive instruments.
- Facilitate on-site adjustments of cavity filters and duplexers.

PROGRAMMABLE TEST CONFIGURATIONS



The R-2680 greatly improves the efficiency of engineers and technicians because it allows the most commonly-used test parameters to be easily stored and recalled when needed.

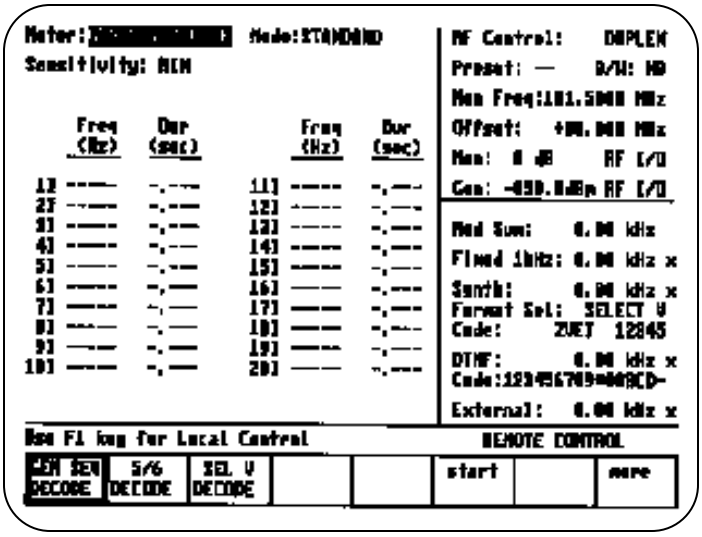
The R-2680 can store and recall:

- Up to 30-channels
- Up to 15 additional test set-ups with:
  - All test conditions
  - Measurement display formats
  - Signal or spectrum characteristics

TONE-SIGNALING ENCODING AND DECODING

The R-2680 provides the capability to encode and decode:

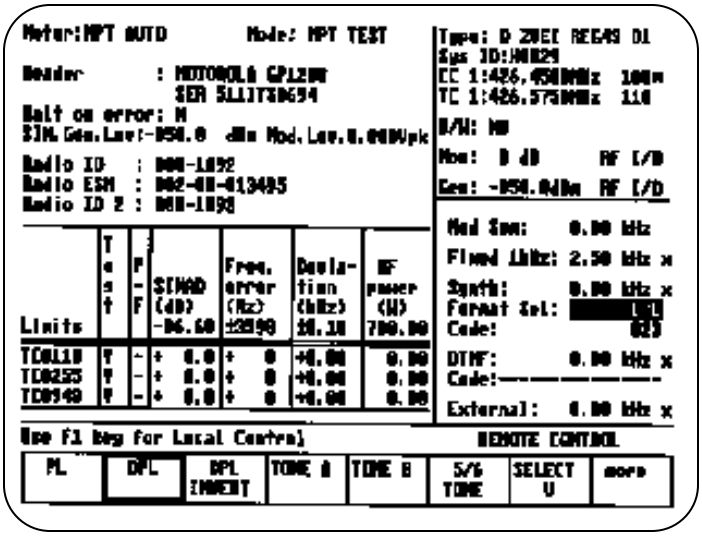
- Select 5
- Private-Line (PL)
- Digital Private-Line (DPL)
- Single tone
- Two tone sequences
- Multi-tone sequences
- DTMF signals
- 5/6 tone paging
- 20 tones in a sequence



MPT 1327/1343 ANALOGUE TRUNKING OPTION

The MPT 1327/1343 option offers:

- User-friendly interface for MPT1327/1343 testing
  - All major MPT 1327/1343 standard configurations are pre-defined and Soft key-selectable
  - Additional parameters or new system configurations can be easily entered and stored
  - Autotest quickly pinpoints most radio faults
- Tests all standard call/receive sequences
- Provides history storage for 99 call/receive telegrams
- Displays all parametric test results on one screen



Specifications

Receiver Test Mode:

RF Generator:

Frequency Range:
400 kHz to 1 GHz
Resolution:
100 Hz
Accuracy:
Refer to the accuracy of the time base
Stabilization Time:
0.1 Second
Output Level:
Range in Frequency Modulation:
RF I/O port: -130 dBm to -50 dBm
Gen out port: -80 dBm to 0 dBm
Range in Amplitude Modulation:
RF I/O port: -130 dBm to -50 dBm
Gen out port: -80 dBm to -3 dBm
Accuracy:
±2 dB from -80 to -130 dBm (RF I/O Port)
±4 dB for all other output levels and ports over the 3 MHz to 1 GHz range.
Spectral Purity:
Spurious:
-35 dBc within ±20 MHz of selected carrier frequency.
Additional fixed spurs at an absolute level of <90 dBm at harmonic frequencies of 5 MHz. (These can affect level and modulation measurements when operated at low levels at or very near these specific frequencies.)
Harmonics:
-20 dBc

Frequency Modulation:

Deviation:
99.5 kHz
Accuracy:
5% of setting ±25Hz @ 1 kHz (NB)
5% of setting ±250Hz @ 1 kHz (WB)
Residual FM:
20 Hz max @ 300 Hz to 3 kHz from center frequency
Internal / External Frequency Range:
5 Hz to 20 kHz, ±2 dB

Amplitude Modulation:

Range:
0 to 90%
Accuracy:
10% of Modulation
Residual AM:
1.0% max @ 300 to 3 kHz from center frequency
Internal / External Frequency Range:
100 Hz to 10 kHz, ±1 dB

Phase Modulation: (Optional Feature)

Range:
0.5 to 10 radians
Accuracy:
±8% at 1 kHz
Resolution:
0.1 radians (0.01 below 2.00 radians)
Internal / External Frequency Range:
300 to 3000 Hz

Receiver Test Mode continued

Sweep Generator:

Range:
400 kHz to 1 GHz
Resolution:
100 Hz
Output Level:
-130 dBm to 0 dBm
Sweep Width:
Selectable up to ±5 MHz of center frequency
Scope Coupling:
Synchronized scope trace to the sweep signal
Accuracy:
Refer to the accuracy of the time base

Duplex Generator:

Range:
400 kHz to 1 GHz
Resolution:
100 Hz
Output Level:
-130 dBm to 0 dBm
Frequency Offset:
0 to ±55MHz in 5 kHz steps
Accuracy:
Refer to the accuracy of the time base

Transmitter Test Mode:

RF Monitor:

Frequency:
Range:
400 kHz to 1 GHz
Resolution:
100 Hz
Accuracy:
Refer to the accuracy of the time base
Spurious Response:
40 dB typical
Sensitivity: (Above 10 MHz)
Narrow band FM:
2.0 uV for 10 dB EIASINAD
Wide band FM:
10 uV for 10 dB EIASINAD

Scan Modes:

Preset Scan:
In monitor mode scans up to 30 user-defined preset frequencies which are stored in the preset memory and locks on signals within the following level range:
- >-30 dBm at the Antenna Port
- >+20 dBm at the RF I/O Port

refer to the programable test memory specification
Frequency Scan:
In Monitor Mode scans user-defined frequency range from 20MHz to 1GHz, and locks on signals within the following level range:
- >-30 dBm at the Antenna Port
- >+20 dBm at the RF I/O Port

Accuracy:
Refer to the accuracy of the time base

FM Deviation Measurement:

Demodulation Range:
±5kHz Maximum in Narrow band
±75kHz Maximum in Wide band
Accuracy:
±5% plus peak Residual FM
Frequency Response:
Selectable per the following:
Low Pass Filters
20 kHz, 3 kHz, 300 Hz
High Pass Filters
5 Hz, 300 Hz, 3 kHz
Demodulated Output Level:
- 0.8V Peak per 1 kHz peak Deviation in Narrow band
- 0.8V Peak per 10 kHz peak Deviation in Wide band

Demodulation Output Impedance:
100 Ohms nominal
Deviation Alarm:
Audible alarm, Selectable in 100 Hz increments

AM Modulation Measurements:

Demodulation Range:
0 to 100%
Accuracy:
±5% for levels below 80%
Frequency Response:
Selectable per the following
Low Pass Filters
20 kHz, 3 kHz, 300 Hz
High Pass Filters
5 Hz, 300 Hz, 3 kHz
Demodulated Output Level:
0.8 V peak per 10% AM Modulation
Demodulation Output Impedance:
100 Ohms nominal

Phase Modulation Measurements: (Optional)

Demodulation Range:
Narrow band = 1 radian
Wide band = 10 radians
Accuracy / Frequency Response:
±5%, ±0.1 rad, ± residual noise at 1 kHz
±7.5%, ±0.1 rad, ± residual noise;
300 to 3500 Hz
Demodulation Output Impedance:
100 Ohms nominal

Transmitter Test Mode continued

Wattmeter (RF I/O Port):

Frequency Range:
3 MHz to 1 GHz
Measurement Range:
0.1 Watt to 125 Watts
Input Impedance:
50 Ohms with a maximum VSWR of 1.5 : 1
Accuracy:
±10%
Protection:
Audible Over Temperature Alarms

Frequency Error Meter:

Type of Display:
Autoranging
Resolution:
1Hz

Signal Strength Indicator:

Range:
3 MHz to 1 GHz
Accuracy:
±4 dB
Sensitivity:
-100 dBm (Antenna Port Rating)

Spectrum Analyser:

Frequency Range:
400 kHz to 1 GHz
Dispersion:
Selectable from keypad
200 kHz window (20 kHz / Div)
500 kHz window (50 kHz / Div)
1 MHz window (100 kHz / Div)
2 MHz window (200 kHz / Div)
5 MHz window (500 kHz / Div)
10 MHz window (1 MHz / Div)
Optional:
20 MHz window (2 MHz / Div)
50 MHz window (5 MHz / Div)
100 MHz window (10 MHz / Div)
Dynamic Range:
60 dB
Bandwidth:
6 kHz / 30 kHz automatically selected
Display Range:
+50 to -95 dBm
Optional Markers:
Freeze
Max Hold
Peak Hold
Delta (Level, Frequency)
Absolute (Level, Frequency)

MPT 1327: (Optional Feature)

Signaling Types: Germany Regionet 43 Sub-bands D1 & D2, UK MPT1327 Band III Sub-bands I & II, Dutch Actionet, Italian Privatex, New Zealand PTC 253, French PAA2424 VHF, French PAA2424 UHF, and Finnish Autonet predefined.
User configurable Signaling Types:
Non-volatile storage of up to 10 user defined signaling types.
Call sequence Tests:
Radio & System Initiated:
- Individual Call
- Group Call
- All Call
- PABX Call
- PSTN Call
- Status Message
- Short Data Message

MPT 1327 Test
Parameter Entries:
(Dependent on Test Selection)
- Signaling Type
- System ID
- Control Channel Number
- Traffic Channel Number
- Call Sequence
- Emergency Priority
- Call Set-up
- Radio ID2 (for System Initiated Tests)
- Group ID
- Group Call Type
- Status Code
- Data Codewords
- Signaling Parameters

Test Measurement
Display:
(Dependent on Test Selection)
- Radio ID
- Radio ESN
- Call Status Indicator
- Control Channel Frequency
- Traffic Channel Frequency
- Emergency Priority
- Group ID
- Group Call Type
- PABX Number
- PSTN Number
- Status Code
- Data Codewords
- Raw Telegrams (Storage for last 99)
- RF Performance Data

Auto Test Capability:
Test up to 3 Traffic Channels for quick SINAD, Frequency Error, Frequency Deviation, and RF Power Measurements.
Radio ID Decoding:
MPT 1327 Format: Prefix-Ident

Test Diagnostics:

Programmable Test Memory:

Preset Memory:
Up to 30 channel preset stores the following user-programmed test parameters:
- Monitor Frequency
- Modulation Types
- Generator Frequency
- Modulation Type
- Bandwidth
- Duplex Offset
- Synthesizer Format Select
- DTMF

Test Setups:
Up to 15 test setups store user-programmed test setups which are independant of the presets. These include:
- All test conditions
- All measurement display formats
- All signal levels

Tracking Generator: (Depends on model)

Frequency Range:
400 kHz to 1 GHz

Tracking Display Sweep Range:
- 200 kHz window (20 kHz / Div)
- 500 kHz window (50 kHz / Div)
- 1 MHz window (100 kHz / Div)
- 2 MHz window (200 kHz / Div)
- 5 MHz window (500 kHz / Div)
- 10 MHz window (1 MHz / Div)
- 20 MHz window (2 MHz / Div)
- 50 MHz window (5 MHz / Div)

Display Range:
0 to -80 dBm

Cable Fault: (Optional)

Method:
Standing Wave Analysis

Measurement:
Cable Fault Distance from Analyser port, Cable Length

Reading:
Meters and Feet

Accuracy:
10%

Frequency Counter:

Frequency Range:
5 Hz to 500 kHz Plus Auto-Tune

Period Counter Range:
5 Hz to 20 kHz

Input Level:
0.1V RMS. minimum

Period Counter Resolution:
Varies with frequency range.
- 5 Hz to 500 Hz = 0.1 Hz
- 500 Hz to 2 kHz = 1 Hz
- 2 kHz to 5 kHz = 10 Hz
- 5 kHz to 20 kHz = 100 Hz

Oscilloscope:

Frequency Response:
0 to 50 kHz

Vertical Input Ranges
Selectable
10 mV, 20 mV, 50 mV, 100 mV, 200 mV, 500 mV, 1 V, 2 V, 5 V, 10 V Per Division

Accuracy:
5% of full scale all ranges

Sweep Ranges:
Selectable
20 µsec, 50 µsec, 100 µsec, 200 µsec, 500 µsec, 1 msec, 2 msec, 5 msec, 10 msec, 20 msec, 50 msec, 100 msec, 200 msec, 500 msec, 1 sec Per Division

Trigger:
- Automatic
- Normal
- Single Sweep

Optional Markers:
- Delta Voltage
- Delta Frequency
- Delta Period

Digital Voltmeter:

Meter Type:
RMS

Frequency Range:
- DC
- AC of 50 Hz to 20 kHz

DC Voltage Ranges:
- 1.0V full scale
- 10.0V full scale
- 100.0V full scale

Accuracy:
1% full scale, ±1 least significant digit

AC Voltage Ranges:
- 1.0V full scale
- 10.0V full scale
- 70.0V full scale

Accuracy:
5% full scale, ±1 least significant digit

Frequency Response:
3 dB end points @ 50 Hz and 20 kHz

SINAD / Distortion Meter:

Input Level:
.1 V to 10 V RMS

SINAD Accuracy:
±1 dB at 12 dB SINAD

Distortion Range:
1% to 20%

Distortion Accuracy:
±0.5% of distortion or ±10% of reading, whichever is greater

Test Diagnostics continued

Audio Signal Types:

- Fixed 1 kHz Tone
- Private-Line (PL)
- Digital Private-Line (DPL)
- Tone A
- Tone B
- 5/6 Paging Tones
- Select 5 Tones
- A/B Sequence Tones
- General Sequence Tones
- Tone Remote
- Dual Tone Multi Frequency (DTMF)
- External Modulation Inputs
  - Microphone
  - BNC input

Frequency Range:
10 Hz to 20 kHz ±1 dB
Mod Output Level:
Selectable to 7.95V Peak
Mod Output Impedance:
100 Ohms Nominal
1kHz Tone Distortion:
Not to exceed 1%
External Modulation Inputs:
Front Panel Jack for HMN-1056D Microphone
Front Panel BNC Jack
BNC Input Impedance:
600 Ohms Nominal
Microphone Input Conditioning:
Internal Audio Limiting providing IDC and Pre-emphasis.

Tone Sequence Decode:

Modulation Types:
Private-Line (PL)
Digital Private-Line (DPL)
Dual Tone Multi Frequency (DTMF)
5/6 Paging Tones
Select 5 Tones
General Sequence Tones
Frequency Accuracy:
±3% from 300 Hz to 3 kHz
Duration Accuracy:
±12 msec for tones greater than 30 msec and 300 Hz

System Operating:

Power and Environmental:

AC Power:
100 - 130 VRMS or 200 - 260 VRMS @ 50 Hz to 440 Hz
DC Power:
+11 to +16 VDC
Battery Pack Option:
+13.6 VDC, 50 Minutes Typical
Weight:
Basic Model: 15kg or 33 Pounds
Temperature:
0 to +50° C (Operating)
-40 to +85° C (Storage)
Dimensions:
Excluding accessories, battery pack and cover: 21.6 cm high x 40.7 cm wide x 43.2 cm deep or 8.5” high x 16” wide x 17” deep

Time Base:

Standard:
Temperature Compensated Crystal Oscillator (TCXO):
Aging 1 PPM per year, Temperature 1 PPM
Optional: Oven Controlled Crystal Oscillator (OCXO):
Aging .5 PPM per year, Temperature .05 PPM

Interface Ports:

Printer and Remote Control:
RS-232 DB25 (Female)
IEEE488.2 (Optional)
Color Monitor:
Standard CGA, RGB DB9 (Female)

MODEL NOMENCLATURE

R-2680A	Communications System Analyser with Tracking Generator and programmable Test Setups as standard features.
R-2680AHS	Communications System Analyser with Tracking Generator,programmable Test Setups and high stability Master Oscillator (OCXO).
R-2680ANT	Communications System Analyser with programmable Test Setups as standard feature.
R-2680ANTHS	Communications System Analyser with programmable Test Setups and high stability Master Oscillator (OCXO).

OPTIONS

FACTORY INSTALLED OPTIONS

RLN-1022A	Signaling hardware module
RLN-1023A	Software Option MPT1327 (necessary for MPT 1327; requires RLN-1022A)
RLN-4034A	C-Message Filter 600 Ohm Meter Load
RLN-4361A	CCITT Filter 600 Ohm Meter Load
RLN-4329A	IEEE 488.2 Interface
RLN-4306A	Cable Fault Locator
RLN-4423A	100 MHz Spectrum Analyser with Markers

ACCESSORIES

SUPPLIED WITH R-2680

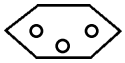
(May also be purchased as additional spare accessories.)

HMN-1056D	Microphone
	Power Cord (see chart)
TEKA-24A	Whip Antenna
58-80386B73	50 Ohm Termination Load
RTL-4011A	Oscilloscope Probe
58-84300A98	Adapter N to BNC
RPX-4097A	DC Power Connector Kit
GG-6530277C002	Spare RF Fuses
68-80309F50	Operator Manual

R-2680 Power Cord Ordering Information

The power cord supplied with the R-2680 ***must*** be specified on the purchase order as a no-charge option. ***Failure to specify a power cord will delay order acceptance.*** The no-charge power cord option part numbers begin with the letter "C." For example: C006 specifies India standard power cord for R-2680

To purchase a spare or replacement power cord, the purchase order must specify the power cord as an accessory. Accessory power cord part numbers begin with the letter "P." For example: P004 specifies Japan standard accessory power cord.

No-Charge Option Part #	Accessory Part #	Plug Pattern	Reference Country or Region
C001	P001		North America / USA Canada / Mexico Central America
C002	P002		Continental Europe (Style CEE7 / 7)
C003	P003		United Kingdom
C004	P004		Japan (Note: Not compatible with North American standard)
C005	P005		Australia / New Zealand
C006	P006		India / Pakistan / Bangladesh / South Africa / (old British style)
C007	P007		Israel
C008	P008		Italy
C009	P009		Switzerland (Note: Not compatible with IEC906-1 standard)
C010	P010		Switzerland

OPTIONAL

RPN-4000A	Battery Pack
1580357B77	Canvas Case
A-001	Transit Case
RTA-4000A	Telescoping Antenna
5880345B96	RF Probe (50 Ohm)
RLN-4375A	Serial / Parallel Dot Matrix Printer
3080387B58	Serial Printer Cable
3080387B59	RS232 Cable (DB25M - DB9F)
3080387B60	CGAMonitor Cable
HLN-9390A	RS232 Adapter (DB9M - DB25F)
6880309E55	Programming Reference Manual (RS232 and IEEE 488.2)
RLN-4120C	Service Manual
RLN-4075A	RF Detector Probe